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Exploring the prevalence of nomophobia, its contributing factors, and the relationship with social interaction anxiety among nursing students

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Abstract

Background Nomophobia and social anxiety have significant negative implications for the physical and mental health of students, as well as their academic performance. Considering the variability in findings across studies on the prevalence of nomophobia and social anxiety, this study aimed to investigate the prevalence of nomophobia, its associated factors, and its relationship with social interaction anxiety among nursing students.

Methods This cross-sectional descriptive-analytical study was conducted between August 22nd and September 23rd, 2023, at the School of Nursing and Midwifery in Kermanshah, located in western Iran. A convenience sampling method was employed, resulting in the recruitment of 258 participants. Data were collected using a three-part questionnaire, including a demographic information form, the Nomophobia Questionnaire (NMP-Q) to assess the severity of nomophobia, and the Social Interaction Anxiety Scale (SIAS) to measure social anxiety levels. Data were analyzed using STATA, version 14. Descriptive statistics were used to summarize demographic and clinical characteristics. The Chi-square test, one-way analysis of variance, the Pearson correlation coefficient, and linear regression modeling were employed for inferential analysis.

Results All participating nursing students ($n = 258$) exhibited some degree of nomophobia. The prevalence of mild, moderate, and severe nomophobia was 40.7%, 40.3%, and 19%, respectively. Furthermore, 25.6% of the students experienced social anxiety. A significant positive correlation was found between nomophobia scores and social interaction anxiety ($r = .37$, $P < .001$). Social interaction anxiety emerged as the only significant independent predictor of nomophobia ($P < .001$), explaining 21% of the variance in nomophobia scores.

Conclusions The results indicate both the prevalence of nomophobia and social anxiety, as well as the correlation between these two factors among students. Considering the numerous risks associated with nomophobia and social interaction anxiety, it is essential to optimize technology use and improve social interactions among students. Identifying students at risk of nomophobia and social interaction anxiety and providing psychological counseling services to them should be prioritized.

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Keywords Nomophobia, Smartphone addiction, Social interaction anxiety, Social anxiety, Nursing students

Introduction

Smartphones have become an integral part of people's lives, facilitating their daily activities [1, 2]. A significant portion of smartphone users is composed of young individuals, particularly students [3]. Smartphones are not merely communication tools but also function as micro-computers [4]. They provide students with easy access to information, video streaming, gaming, online shopping, and online learning without time or location limitations [5–7]. Despite the benefits of smartphones, excessive usage can lead to psychological disorders such as internet addiction, smartphone addiction, and nomophobia [7].

Internet addiction refers to a condition in which individuals exhibit excessive or poorly regulated thoughts, cravings, or behaviors related to computer usage and online activities, resulting in significant distress or functional impairments in their daily lives [8]. Nursing students are at risk of internet addiction and nomophobia due to factors such as limited social interactions, academic pressures, long shifts, and the desire to escape from real-life problems [1, 6, 9]. Additionally, some students may develop internet dependency to access information related to their studies and profession [1]. Nomophobia, short for “No MOBILE PHone phoBIA,” is defined as anxiety and fear when individuals are unable to access their smartphones [10]. People suffering from this disorder experience fear and uneasiness when they lose signal, cannot access information or communicate, or when their phone battery dies [10, 11].

The prevalence of nomophobia appears to be on the rise, with some researchers labeling it “the phobia of the 21st century” [11, 12]. Students, who are highly adaptable to new technologies, often treat their smartphones as a companion, making them susceptible to addiction to various smartphone functions [2]. This susceptibility to smartphone addiction, coupled with the integral role smartphones play in students' lives, has led to concerns about the prevalence of nomophobia among this population [13]. For example, a 2023 systematic review and meta-analysis by Tuco et al. (2023) highlighted the high prevalence of nomophobia among students, with some studies reporting rates nearing 100% [14]. However, the study also emphasized that the prevalence of nomophobia can vary considerably depending on factors such as assessment tools, cutoff scores, and the specific student population studied. This variability is evident in findings from other studies. For instance, a 2019 study in the United States by Cain & Malcolm (2019) found that 99.5% of students had varying degrees of nomophobia [15], while research conducted among Egyptian students by El-Ashry et al. (2024) indicated that 40.3% of them

suffered from severe nomophobia [16]. Similarly, studies conducted among Iranian students in 2019 by Jafari et al. and Mosalanejad et al. also indicate a high prevalence of smartphone addiction [3, 17].

Nomophobia can negatively impact various aspects of a student's psychological, academic, social, and professional life [12]. Some of the negative effects include decreased concentration, procrastination of scholarly activities, drowsiness in class, distractions, and consequently reduced academic performance [18]. Nomophobia can elicit and exacerbate certain psychological symptoms [19]. Several studies have found a significant association between nomophobia and social anxiety disorders, particularly anxiety in social interactions [7, 13, 19–22]. Social anxiety disorder, also known as social phobia, is a mental health condition characterized by intense feelings of anxiety, self-consciousness, and embarrassment in everyday social interactions [23]. Social anxiety negatively impacts all aspects of life, including work, education, and emotional, social, and familial communication with others. This results in disruptions in academic and professional performance, excessive anxiety, and the avoidance of feared situations [24].

Individuals with nomophobia often prefer using technology over face-to-face communication to establish connections [10]. They distance themselves from social interactions and activities in the physical and real world, finding a sense of security and comfort in the online realm compared to the physical world [25]. In a similar vein, socially anxious individuals tend to prefer virtual communication over face-to-face interactions to avoid feelings of fear and worry, shifting many of their social activities from the real world to the virtual world [7, 13]. From this perspective, the unavailability of a mobile phone or the perception of being separated from it can be a source of anxiety and concern for individuals experiencing social interaction anxiety, as the use of smartphones serves as a coping strategy to alleviate social anxiety [7]. However, in contrast, a study conducted in India (2021) by Ghosh et al. (2021) found no significant relationship between mobile phone addiction and social phobia [26].

Existing evidence suggests a relatively high prevalence of social anxiety among students. For instance, a 2023 study by Chu et al. (2023) among Chinese students showed that 36.3% of them exhibited social anxiety [27]. Similarly, Al-Johani et al. (2022) found that 51% of students in Saudi Arabia experienced social anxiety [28]. In Iran, a 2021 study by Afshari et al. (2021) revealed that 13.2% of students had high levels of social phobia [29]. Social anxiety, in turn, can affect various aspects

of students' lives, including academic performance, the quality of friendships, and social relationships, ultimately impacting their future and altering their overall quality of life [27, 30, 31].

It is worth noting that culture can significantly influence individuals' experiences of nomophobia and social anxiety [21]. In some cultures, face-to-face and in-person interactions are valued more highly than virtual and online communication [32]. Such cultural values may impact the extent to which students rely on mobile phones as a coping mechanism for social anxiety [33]. Furthermore, the concept of "excessive" mobile phone use can vary across cultures. In certain cultures, high levels of mobile phone use may be considered entirely normal, whereas in others, it may be perceived as an addiction or dependency [34, 35]. Therefore, further research is required to better understand the specific impact of Iranian culture on these phenomena.

Combating nomophobia and social interaction anxiety among students requires multifaceted intervention strategies. To address nomophobia, universities can offer workshops and awareness campaigns on digital health, responsible smartphone use, and the potential risks associated with nomophobia [36, 37]. Additionally, individual and group counseling services can provide students with coping mechanisms and strategies to manage smartphone usage and reduce their dependence on mobile devices [38]. Integrating digital health education into academic curricula can further empower students to make informed decisions about their technology use and promote healthy digital habits [39].

Furthermore, addressing social interaction anxiety can involve strategies such as cognitive-behavioral therapy, group therapy, support groups, and participation in extracurricular activities and social events [40]. By implementing these strategies, universities can mitigate the negative impacts of nomophobia and social interaction anxiety on student well-being and academic success.

Despite the negative consequences of both nomophobia and social interaction anxiety on various aspects of students' lives, there is a lack of sufficient research in Iran examining the relationship between these two variables among nursing students, particularly within the context of Iranian culture. As a result, this study aims to address this gap by investigating the association between nomophobia and social interaction anxiety among Iranian nursing students. The findings will assist university policymakers in managing smartphone use and promoting social interactions among nursing students.

This study sought to answer the following questions:

1. What is the prevalence of nomophobia among nursing students in Kermanshah-Iran?

2. What is the prevalence of social anxiety among nursing students in Kermanshah-Iran?
3. What is the relationship between nomophobia and social interaction anxiety among nursing students in Kermanshah-Iran?
4. Which factors are associated with nomophobia among nursing students in Kermanshah-Iran?

Materials and methods

Study design

This study employed a cross-sectional, descriptive-analytical design, conducted from August 22 to September 23, 2023. The results were reported in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines [41].

Sample and sampling method

The study population included all nursing students enrolled in the second semester of the 2023 academic year at the School of Nursing and Midwifery in Kermanshah, western Iran. The total number of undergraduate and postgraduate students was 447 and 54, respectively. The sample size was estimated based on a study by Kaur et al. (2021) [20], considering a 95% confidence level, an 80% test power, and a correlation coefficient of 0.221 between nomophobia and social interaction anxiety. The calculated sample size was 158. However, given that the current study examined additional variables, including 10 independent variables, an additional 10 participants were included for each variable, increasing the sample size to 258. Participants were selected through convenience sampling. Inclusion criteria were: consent to participate, enrollment as an undergraduate or postgraduate nursing student, and smartphone ownership.

Instruments

Data were collected using a demographic information form, the Nomophobia Questionnaire (NMPQ), and the Social Interaction Anxiety Scale (SIAS). The demographic form collected data on age, gender, marital status, place of residence, family income, educational level, GPA, and smartphone usage. The NMPQ, developed by Yildirim and Correia (2015) [42], has been validated in various studies [10, 43]. Its validity and reliability were confirmed in Iran by Lin et al. (2018), who reported a Cronbach's alpha of 0.92 [44]. The questionnaire consists of 20 items rated on a seven-point Likert scale (1 = strongly disagree, 7 = strongly agree). A score of 20 indicates no nomophobia, while scores between 21 and 59, 60–99, and 100–140 reflect mild, moderate, and severe nomophobia, respectively [10]. The questionnaire includes four subscales: inability to communicate, loss of connectedness, inability to access information, and giving up convenience [43].

The SIAS, developed by Mattick and Clarke (1998) [45], has been validated across several English-language studies [46]. The Persian version's internal consistency was confirmed in Iran, with a Cronbach's alpha of 0.87 [47]. The scale comprises 20 items rated on a five-point Likert scale (0 = does not apply, 4 = applies extremely). Higher scores indicate greater levels of social anxiety [46, 48], and a score of 34 or higher suggests clinically significant social anxiety symptoms [49].

In this study, both the NMPQ and SIAS were validated for content by presenting the questionnaires to 12 faculty members, who reviewed them for clarity, simplicity, and relevance. Cronbach's alpha was used to measure reliability, with values of 0.91 and 0.88 for the NMPQ and SIAS, respectively.

Additionally, GPA was reported using Iran's grading system, where scores range from 0 to 20, with 20 being the highest, and 10 the minimum required to pass.

Data collection

Participants were invited to participate via links distributed through private student groups on popular social networking platforms (e.g., WhatsApp, Telegram, Instagram). Those interested in participating provided informed consent and accessed the questionnaire via a secure link. To minimize selection bias, student representatives were enlisted to distribute information about the study to peers, ensuring a broader reach, even to students less active on social media. The link was deactivated after the designated data collection period to ensure data integrity. Participants were reminded to respond truthfully, emphasizing the importance of individual answers, despite potential peer influence or social norms on social media.

Data analysis

Data were analyzed using both descriptive and inferential statistics. Descriptive statistics (frequency, percentage, mean, standard deviation) were used to summarize sample characteristics. The Chi-square test was applied to examine associations between nomophobia severity and categorical demographic variables. One-way ANOVA was used to assess relationships between nomophobia severity and continuous variables. The Pearson correlation coefficient evaluated the relationship between nomophobia and SIAS scores. A linear regression model was constructed to predict nomophobia scores based on demographic variables and SIAS scores. Variables with a p -value < 0.2 in the univariate analysis were included in the multiple regression model. STATA-14 software was used for all analyses, and significance was set at $p < .05$.

Ethical considerations

Ethical approval was obtained from the Ethics Committee of Kermanshah University of Medical Sciences (Approval Code: IR.KUMS.REC.1402.187). Before data collection, participants were provided with detailed informed consent, explaining the study's purpose, procedures, potential risks, benefits, and data confidentiality. Participants were also informed of their right to withdraw at any time without penalty. Completing and submitting the questionnaire indicated informed consent.

Results

The study included participants with a mean age of 23.1 ± 3.1 years, predominantly female (52.7%) and single (92.2%). Most resided off-campus (59.3%) and reported sufficient family income (89.1%). The majority were undergraduate students (88.8%) with GPAs above 15. On average, participants had used smartphones for 8.4 ± 3.6 years, spent 5.5 ± 2.9 h per day on their phones, 4.7 ± 2.7 h online, and checked their phones about 8.0 ± 13.2 times per hour. A notable proportion carried power banks (33.3%), checked their phones before bed (87.2%), and upon waking (82.6%) (Table 1).

Participants had a mean nomophobia score of 71.5 ± 28.0 out of 140. Of these, 40.7% had mild nomophobia, 40.3% moderate, and 19.0% severe. The mean scores for nomophobia subscales ranged from 14.9 to 22.4. Additionally, 25.6% of participants reported social anxiety, with a mean SIAS score of 23.8 ± 13.6 out of 80 (Table 2).

Significant associations were found between nomophobia levels and smartphone use behaviors, including carrying power banks, checking phones before sleep, and immediately after waking. A significant correlation was observed between overall nomophobia and social interaction anxiety ($r = .37$, $P < .001$), as well as between all nomophobia subscales and social interaction anxiety ($P < .001$) (Table 3).

Multiple regression analysis indicated that each unit increase in social interaction anxiety score predicted a 0.71-point increase in the nomophobia score ($B = 0.71$, $P < .001$). The model explained 21.0% of the variance in nomophobia scores (Table 4). These results emphasize the interconnectedness between social interaction anxiety, smartphone use patterns, and nomophobia levels among participants.

Discussion

This study aimed to determine the prevalence of nomophobia, its associated factors, and the relationship between nomophobia and social interaction anxiety in nursing students. The findings indicated that more than two-thirds of the students had mild to moderate nomophobia, and approximately one-fifth had severe

Table 1 Demographic characteristics of study participants (n = 258)

Variables	Total, n (%) / Mean ± SD [‡]	
Age (years)	≤ 21	77 (29.9)
	22–25	150 (58.1)
	> 25	31 (12.0)
	Female	136 (52.7)
	Male	122 (47.3)
Marital status	Single	238 (92.2)
	Married	20 (7.8)
Place of residence	On-Campus	105 (40.7)
	Off-Campus	153 (59.3)
Family income	Sufficient for expenses	230 (89.1)
	Insufficient for expenses	28 (10.9)
Educational level	Bachelor of Science	229 (88.8)
	Master of Science	29 (11.2)
Grade point average	≥ 15	52 (20.2)
	> 15	206 (79.8)
Years of smartphone use	–	8.4 ± 3.6
Hours of daily smartphone use	–	5.5 ± 2.9
Hours of daily mobile internet use	–	4.7 ± 2.7
The frequency of checking smartphone per hour	–	8.0 ± 13.2
Always having a power bank	Yes	86 (33.3)
	No	172 (66.7)
Checking the mobile phone before sleep	Yes	225 (87.2)
	No	33 (12.8)
Checking the mobile phone upon waking up in the morning	Yes	213 (82.6)
	No	45 (17.4)

Note: [‡]Standard deviation

nomophobia. All participants (clarified for consistency) exhibited varying degrees of nomophobia. Consistent with the findings of the present study, previous research conducted among students from various academic disciplines, including health sciences (such as nursing, medicine, and physiotherapy), reported the highest prevalence of moderate nomophobia [5, 14, 25, 50, 51]. In a 2023 study from Turkey, all nursing students had different degrees of nomophobia, with 52.6% of them having moderate nomophobia [51]. In Saudi Arabia (2023), 97.3% of students experienced nomophobia, with 44.1%, 48.3%, and 4.9% of students having mild, moderate, and severe nomophobia, respectively [5]. Additionally, a systematic review and meta-analysis (2023) examining the prevalence of nomophobia in 23 studies reported a prevalence of 25%, 59%, and 15% for mild, moderate, and severe nomophobia, respectively, among health science students, regardless of their field of study [14]. In contrast, a study conducted in Saudi Arabia in 2023 reported that (smoother transition) 98.4% of physiotherapy students had nomophobia, with a prevalence of 74.8%, 22.7%, and 0.9% for mild, moderate, and severe nomophobia,

respectively [52]. However, it is important to note that these studies were conducted in diverse cultural and educational contexts, which could influence the prevalence and severity of nomophobia. For instance, a study conducted in Egypt in 2024 among nursing students reported the highest prevalence of severe nomophobia at a rate of 40.3%, while mild and moderate nomophobia were reported at rates of 27.5% and 28.5%, respectively [16]. This discrepancy highlights the importance of considering contextual factors when interpreting and comparing findings across studies. Young individuals, such as students, have a closer relationship with technology, and their lives are intertwined with its use. They use smartphones more frequently than others, making them more vulnerable to smartphone-related issues (simplified wording) such as nomophobia [13, 53]. Furthermore, participation in online classes and workshops, academic research via the internet and social media, and interactions with classmates and professors can lead to increased dependence on smartphones among students. The COVID-19 pandemic may have exacerbated these conditions [16]. Excessive use of the internet and social networks, as well as nomophobia, can impact students' communication skills, attention and concentration, motivation, and academic performance, thereby affecting the quality of care provided to patients, patient safety, and their performance at higher educational levels [9, 54]. To address the specific cultural context of Iran, universities should proactively identify students struggling with problematic technology use and offer educational programs promoting healthy tech habits [36, 37]. Understanding the cultural significance of face-to-face interactions in Iranian society can provide insight into how these factors contribute to nomophobia and social anxiety [55]. Additionally, they might consider establishing a virtual addiction clinic to provide specialized support for students with severe technology-related dependencies.

The prevalence of social anxiety among nursing students has been reported at 25.6%, raising concerns. A study conducted in India in 2014 revealed that 64.6% of nursing students experienced mild social anxiety, while 27.4% experienced moderate social anxiety [56]. However, it is essential to acknowledge that cultural factors can significantly influence the prevalence and manifestation of social anxiety [57, 58]. For example, among nursing students in China (2023), the prevalence of social anxiety was reported as 36.3% [28], which might be influenced by cultural norms emphasizing collectivism and interpersonal harmony. Similarly, among medical students in Malaysia (2022) and Saudi Arabia (2022), social anxiety prevalence was reported as 20.14% and 51%, respectively [27, 48]. These variations could be attributed to differences in cultural perspectives on social interaction, help-seeking behaviors, and perceptions of mental

Table 2 Distribution of research participants based on the severity of nomophobia ($n = 258$)

Variables		Nomophobia grade					Test results	Significant difference (post hoc) [€]
		Absence	Mild	Moderate	Severe	Total		
Age (years), n (%)	≤ 21	—	31 (29.5)	34 (32.7)	12 (24.5)	77 (29.9)	$X^2 = 2.55$	—
	22–25	—	59 (56.2)	61 (58.7)	30 (61.2)	150 (58.1)	$P = .636$	—
	> 25	—	15 (14.3)	9 (8.7)	7 (14.3)	31 (12.0)		—
Sex, n (%)	Female	—	51 (48.6)	58 (55.8)	27 (55.1)	136 (52.7)	$X^2 = 1.22$	—
	Male	—	54 (51.4)	46 (44.2)	22 (44.9)	122 (47.3)	$P = .542$	—
Marital status, n (%)	Single	—	94 (89.5)	97 (93.3)	47 (95.9)	238 (92.2)	$X^2 = 2.16$	—
	Married	—	11 (10.5)	7 (6.7)	2 (4.1)	20 (7.8)	$P = .339$	—
Place of residence, n (%)	On-Campus	—	37 (35.2)	45 (43.3)	23 (46.9)	105 (40.7)	$X^2 = 2.37$	—
	Off-Campus	—	68 (64.8)	59 (56.7)	26 (53.1)	153 (59.3)	$P = .305$	—
Family income, n (%)	Sufficient for expenses	—	94 (89.5)	96 (92.3)	40 (81.6)	230 (89.1)	$X^2 = 3.95$	—
	Insufficient for expenses	—	11 (10.5)	8 (7.7)	9 (18.4)	28 (10.9)	$P = .139$	—
Educational level, n (%)	Bachelor of science	—	94 (89.5)	95 (91.3)	40 (81.6)	229 (88.8)	$X^2 = 3.25$	—
	Master of science	—	11 (10.5)	9 (8.7)	9 (18.4)	29 (11.2)	$P = .197$	—
Grade point average, n (%)	≤ 15	—	24 (22.9)	21 (20.2)	7 (14.3)	52 (20.2)	$X^2 = 1.53$	—
	> 15	—	81 (77.1)	83 (79.8)	42 (85.7)	206 (79.8)	$P = .466$	—
Years of smartphone use, Mean ± SD [¥]	—	—	8.3 ± 4.1	8.5 ± 3.4	8.7 ± 3.2	8.4 ± 3.6	$F = 0.26$	—
							$P = .773$	
Hours of daily smartphone use, Mean ± SD	—	—	4.8 ± 2.4	5.7 ± 2.7	6.8 ± 3.7	5.5 ± 2.9	$F = 8.43$	Mild-severe ($p < .001$)
							$P < .001$	
Hours of daily mobile internet use, Mean ± SD	—	—	3.9 ± 2.4	4.8 ± 2.5	5.8 ± 3.2	4.7 ± 2.7	$F = 8.82$	Mild-moderate ($p = .047$)
							$P < .001$	Mild-severe ($p < .001$)
The frequency of checking smartphone per hour, Mean ± SD	—	—	7.2 ± 16.0	8.2 ± 12.0	9.3 ± 8.2	8.0 ± 13.2	$F = 0.46$	—
							$P\text{-value} = 0.631$	
Always having a power bank, n (%)	Yes	—	26 (24.8)	39 (37.5)	21 (42.9)	86 (33.3)	$X^2 = 6.28$	—
	No	—	79 (75.2)	65 (62.5)	28 (57.1)	172 (66.7)	$P = .043$	—
Checking the mobile phone before sleep	Yes	—	80 (76.2)	96 (92.3)	49 (100.0)	225 (87.2)	$X^2 = 21.04$	—
	No	—	25 (23.8)	8 (7.7)	0 (0.0)	33 (12.8)	$P < .001$	—
Checking the mobile phone upon waking up in the morning	Yes	—	71 (67.6)	95 (91.3)	47 (95.9)	213 (82.6)	$X^2 = 27.92$	—
	No	—	34 (32.4)	9 (8.7)	2 (4.1)	45 (17.4)	$P < .001$	—

[¥] Standard deviation; [€] The Scheffé test

Table 3 Pearson correlations among study variables[¥]

Variables	1	2	3	4	5	6
1. Social Interaction Anxiety Scale	1					
2. NMPQ [€] -Not being able to communicate	0.224	1				
3. NMPQ-Losing connectedness	0.399	0.658	1			
4. NMPQ-Not being able to access information	0.304	0.590	0.635	1		
5. NMPQ-Giving up convenience	0.376	0.656	0.737	0.718	1	
6. NMPQ-total	0.370	0.864	0.873	0.826	0.894	1

[¥] All correlations are significant at the 0.001 level; [€] Nomophobia Questionnaire

health [57, 58]. In the Iranian context, cultural factors such as family expectations, social norms, and the pressure to conform to collective values may further exacerbate social anxiety among students [59, 60]. For instance, the emphasis on maintaining family honor and meeting societal expectations can create additional stress, leading to heightened feelings of inadequacy in social situations.

In a study conducted in Ethiopia in 2020, 32.8% of health science students reported social anxiety [31]. This finding highlights that social anxiety is a concern across diverse geographical regions, but further research is needed to understand the specific sociocultural factors contributing to its prevalence in different settings. Moreover, in Iran (2021), the prevalence of social phobia

Table 4 Predictive factors of nomophobia using multiple regression

Model	Variable levels	B	SE	t	95% CI [‡]	P-value
(Constant)		27.41	11.57	2.37	4.63, 50.19	0.019
Social Interaction Anxiety Scale		0.71	0.12	6.10	0.48, 0.93	< 0.001
Marital status	Single	Ref.				
	Married	-3.40	6.00	-0.57	-15.22, 8.42	0.572
Place of residence	On-Campus	Ref.				
	Off-Campus	-2.24	3.25	-0.69	-8.63, 4.16	0.491
Grade Point Average	15≥	Ref.				
	> 15	7.63	3.94	1.94	-0.14, 15.40	0.054
Years of smartphone use		0.78	0.44	1.79	-0.08, 1.64	0.075
Hours of daily smartphone use		1.36	0.95	1.43	-0.51, 3.22	0.154
Hours of daily mobile internet use		1.39	1.01	1.37	-0.61, 3.39	0.172
The frequency of checking smartphone per hour		0.03	0.12	0.22	-0.21, 0.27	0.827

[‡] Confidence interval; R² = 0.24, R²_{adj} = 0.21

among medical science students was reported as 46.3% for mild, 41.5% for moderate, and 13.2% for severe cases [29]. This indicates that the severity of social anxiety can also vary significantly across populations [30]. Overall, the reported prevalence rates of anxiety and social phobia among students are noteworthy and require attention and follow-up. However, it is crucial to avoid generalizing these findings across diverse student populations without considering the potential influence of cultural, societal, and educational factors.

Our findings suggest that within the Iranian context, social anxiety is a significant issue in the university setting and necessitates serious attention and intervention. This cultural backdrop underscores the importance of addressing these issues comprehensively, considering that Iranian students may face unique pressures that influence their mental health [60]. Given the prevalence of social anxiety among students, universities should implement programs that equip students with practical coping skills and provide access to professional support [60, 61]. This includes offering culturally sensitive communication skills training and workshops on coping strategies, such as deep breathing and positive visualization [40, 62–64]. Encouraging student participation in group activities can also foster social engagement [63–65]. Furthermore, integrating cultural awareness into these programs can enhance their effectiveness, ensuring students feel understood and supported in their specific contexts [60]. Additionally, universities should provide readily available individual and group counseling services and facilitate peer support groups to address students’ social anxiety challenges effectively [66]. By creating an environment that promotes open discussions about mental health and cultural factors, universities can play a crucial role in mitigating social anxiety among Iranian students.

Age did not show a statistically significant relationship with nomophobia intensity within the Iranian context. This finding aligns with several studies where no

significant association was observed between age and nomophobia among students [67, 68]. However, some studies have reported a significant relationship between these two variables [69]. For instance, a 2024 Egyptian study identified older age (over 20 years) as a predictor of nomophobia among students. This association was explained by students’ classification as digital natives, having grown up with smartphones as integral parts of their lives [16]. Similarly, a 2019 Indian study identified increasing age as a predictor of nomophobia among students [70]. In contrast, a 2022 Peruvian study found significantly lower average nomophobia scores among students aged 24 and older, and those aged 21–23, compared to those aged 18–20. This finding was attributed to the greater familiarity and engagement with technology among younger students [71]. It is important to note, however, that all mentioned age groups represent technology consumers with significant familiarity. Given the inconsistent findings regarding the relationship between age and nomophobia, drawing a definitive conclusion is difficult. Variables such as personality traits, emotional regulation abilities, resilience, work and educational demands, and individual reliance on smartphones can all influence this relationship, emphasizing the need for further investigation.

Although no significant gender differences in nomophobia were identified, consistent with previous research [16, 25, 43, 67, 68], this finding merits further investigation. It is essential to recognize that the absence of statistically significant differences in nomophobia levels between genders does not necessarily imply a lack of gendered experiences related to smartphone dependency. In Iranian culture, societal expectations and gender roles may shape technology usage patterns and individuals’ relationships with their devices. For example, while some studies have reported no gender differences in nomophobia [16, 25, 43, 67, 69, 72], others, particularly those conducted in distinct cultural settings such as Saudi Arabia

[5] and Pakistan [68], have found a higher prevalence of nomophobia among female students. Similarly, two studies conducted in Turkey (2021) and Jordan (2024) reported that the average nomophobia scores of female students were significantly higher than those of male students [50, 73]. These contrasting findings highlight the importance of considering how sociocultural factors, including gender norms and expectations surrounding technology use, might contribute to observed differences. Future research should explore the nuanced ways in which gender roles and societal expectations intersect with smartphone dependency. Investigating potential variations in nomophobia's manifestation, contributing factors, and consequences across genders within specific cultural contexts is essential.

In the Iranian context, the level of nomophobia was not significantly associated with place of residence and family income. Similarly, other studies [16, 25, 52, 67, 72, 74] also found no significant relationship between nomophobia and students' place of residence or family income [43, 67]. However, in a study conducted in Saudi Arabia (2023), the level of nomophobia was significantly higher among students who did not live with their families [5], which could be attributed to their increased sense of loneliness and increased use of smartphones for communication with loved ones. Nevertheless, such a conclusion cannot be inferred based on the findings of the present study. In explaining the lack of association between place of residence and the severity of nomophobia, various factors such as individuals' personality traits, emotional control abilities, and family dynamics can be considered, which were not examined in the present study. In a study conducted in India (2021), the average score of nomophobia was higher among students from higher-income families. Furthermore, in this study, students with both parents employed had a significantly higher average score of nomophobia compared to students with only the father employed [20]. While the employment of both parents leads to higher family income, it can also result in reduced support, supervision, and interaction with parents, which may increase vulnerability to mobile phone dependency and the occurrence of nomophobia.

In the present study, no statistically significant differences were observed in nomophobia levels based on educational level or GPA. Similarly, a study conducted in China (2024) found no association between academic year or educational level and nomophobia [75]. Ferchichi et al. (2023) also reported no significant relationship between nomophobia and academic year among nursing students in Tunisia [67]. However, a study in Bangladesh (2023) found that first-year students had significantly higher nomophobia scores compared to those in higher academic years and master's degree students [43]. Conversely, a study conducted in Egypt (2024) among nursing

students revealed that final-year undergraduate students had significantly higher average nomophobia scores [16]. Furthermore, consistent with the present findings, several prior studies did not identify a significant relationship between GPA and nomophobia [25, 43]. Conversely, a study conducted in Saudi Arabia (2023) found that students with the highest GPA and the highest amount of study time during the week had the highest nomophobia scores [5]. On the other hand, another study in Ghana (2021) showed that the absence of nomophobia was significantly associated with high academic performance [72]. Given the multifaceted nature of academic performance and the variety of factors influencing it, no definitive conclusion regarding the relationship between nomophobia and academic performance can be drawn. Students use their smartphones for various academic and non-academic purposes, making it challenging to isolate the impact of smartphone use on academic performance. Therefore, for these individuals, meeting many needs—including academic ones—depends heavily on technology use. This dependency can cause students, regardless of their academic focus, to rely heavily on smartphones. The lack of access to mobile phones and the information on them can trigger anxiety and concern. Although nomophobia, with symptoms such as anxiety and depression, can have a long-term impact on academic performance, policymakers should consider strategies to reduce students' dependence on smartphones.

The findings of the present study indicate no significant difference in nomophobia intensity based on the number of years of smartphone use or the frequency of checking mobile phones per hour. These results align with studies that reported no significant correlation between years of smartphone use [16, 69, 75] and the frequency of checking mobile phones [16, 67] with nomophobia. However, a study conducted among nursing students in Tunisia (2023) and a study of youth aged 18–24 in Portugal (2020) identified a significant relationship between years of smartphone use and nomophobia [11, 67]. Similarly, research by Bartwal and Nath (2020) among medical students in India and by Al Ali and Matarneh (2024) among students in health-related fields in Jordan found a significant correlation between the frequency of phone checking and nomophobia [69, 73].

In the present study, students with severe nomophobia had significantly higher average daily smartphone usage compared to students with mild nomophobia. Additionally, students with moderate and severe nomophobia had significantly higher average internet usage on smartphones than those with mild nomophobia. However, in multiple regression analysis, these two variables were not predictors of nomophobia. Previous studies have indicated a significant correlation between the average daily hours of smartphone use and the intensity

of nomophobia [16, 50, 67–69, 75]. Furthermore, some studies have identified smartphone usage during the day as a predictor of nomophobia [16, 43, 68]. It is reasonable to expect that increased daily smartphone use would lead to greater dependence, and subsequently, anxiety when the smartphone is unavailable. However, according to the results of the present study, the number of hours of smartphone use alone does not necessarily lead to nomophobia in students. This is consistent with a study conducted in Jordan (2024), where hours of smartphone use were not a significant predictor of nomophobia. However, the number of phone calls made during the day and the number of received text messages were predictors of nomophobia [73]. Factors such as the purpose of smartphone use and its importance in daily life, work, and education may contribute to these findings.

Limitations

This study has several limitations that should be considered when interpreting and generalizing the results. The cross-sectional design limits the ability to establish a cause-and-effect relationship between the study variables. Additionally, the study identifies correlations between nomophobia and social anxiety but does not explore potential causal relationships or underlying mechanisms. This limitation highlights the need for future research employing experimental or longitudinal designs to better understand these dynamics. The long-term effects of nomophobia on academic performance and mental health were not addressed, limiting a more comprehensive understanding of the issue. The data collection method, which relied on self-reporting, may have introduced response bias, affecting the accuracy of the results. The sampling method employed was convenience sampling, which may limit the generalizability of the findings. Furthermore, the influence of various factors such as age, gender, and socio-cultural aspects on the relationship between nomophobia and social interaction anxiety was not explored in the present study. Another potential limitation is the data collection method through social media links, which may have introduced issues such as multiple submissions or incomplete responses, despite efforts to mitigate these concerns. While participants were instructed at the beginning of the questionnaire to refrain from submitting multiple responses, controlling for this issue was ultimately beyond the researcher's ability. It is also acknowledged that while the study targeted nursing students through dedicated online groups, self-selection bias cannot be entirely ruled out, as there is a possibility, albeit minimal, that individuals outside the target population might have accessed the questionnaire link. Additionally, the use of social media for data collection may have influenced participants' responses based

on peer opinions or social norms, further impacting the validity of the data.

Conclusion

This study investigated the prevalence of nomophobia, its associated factors, and its relationship with social interaction anxiety among nursing students. Most students experienced mild to moderate nomophobia, with one-fourth exhibiting social anxiety. A weak but significant correlation was found between nomophobia and social anxiety. Social anxiety, marital status, place of residence, Grade Point Average, number of years of smartphone use, daily hours of smartphone and internet use, and frequency of checking smartphones per hour explained 21% of the variance in nomophobia scores. However, social interaction anxiety was the only significant predictor of nomophobia.

These findings contribute to existing knowledge by highlighting the multifaceted nature of nomophobia and its significant relationship with social interaction anxiety. The study underscores the importance of addressing social interaction anxiety as a primary intervention point for reducing nomophobia among nursing students. Educating students on optimal technology use and encouraging the limitation of smartphone and internet time can help reduce nomophobia. Managing technology time and establishing healthy boundaries can improve students' social interactions. Training and developing communication and social skills can further support students in successfully engaging in social interactions and reducing anxiety. Additionally, providing psychological counseling services to individuals at risk of nomophobia and social interaction anxiety is crucial.

Universities can play a proactive role in mitigating nomophobia by implementing the aforementioned multi-tiered strategies. Through the integration of preventative education, early identification and intervention, and comprehensive support services, universities can foster a healthier digital environment that supports students' well-being and academic success. This study's findings underscore the need for targeted interventions that address both nomophobia and its psychological correlates, contributing to the broader understanding of how technology-related anxieties affect student populations.

Future longitudinal studies are recommended to determine the direction of the relationship between nomophobia and social interaction anxiety. Additionally, exploring the underlying mechanisms driving this relationship would provide a more comprehensive understanding of the interplay between these variables and inform more effective intervention strategies.

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Author contributions

NS, MJ, PH, SR, and AK contributed to designing the study. NS, MJ, and PH collected the data, and the data was analyzed by SR. The final report and manuscript were written by NS, MJ, PH, SR, and AK. All the authors read and approved the version for submission.

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Data availability

The identified datasets analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate

The study received ethical approval from the Ethics Committee of Kermanshah University of Medical Sciences, with the code IR.KUMS.REC.1402.187. By completing and submitting the questionnaires, participants indicated their voluntary and informed consent to participate in the study. All methods were conducted in accordance with applicable guidelines and regulations.

Consent for publication

Not Applicable.

Competing interests

The authors declare no competing interests.

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